

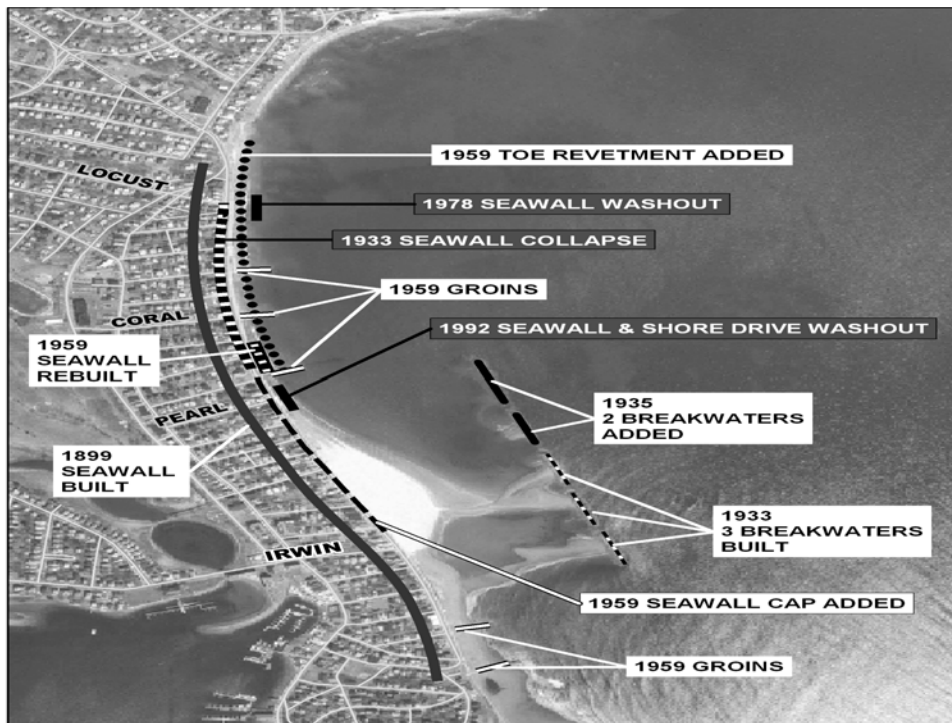
Without a doubt, Winthrop Beach has proven to be the most lengthy, complex and difficult project of the Boston Harbor Beaches Program. The 1993 Plan for the Future of the Boston Harbor Beaches proposed an ambitious program of landscape and related amenities to improve the appearance, access and the overall beach-user experience at the Harbor Beaches, but the problem at Winthrop is of a far greater magnitude than a shabby appearance or lack of benches.



Winthrop Beach developed as a coastal resort in the 19th century but, typical of the times, with little attention to, or no understanding of the dynamics of a barrier beach system. Its open ocean frontage exposes it to punishing storms. When the Portland Gale of 1898 devastated the community, the Beach was transferred to the Metropolitan Parks Commission and the original seawall was constructed. and neighboring natural sources of sediment necessary to replenish the beach disappeared under stone armoring. Over the following century, additional shore protection structures were constructed to tame storm energy. But storm driven waves easily overwhelm existing shore protection features along the eroded beach resulting in overtopping, flooding and frequent damage. The Army Corps conservatively estimated damages from the 1992 storm at \$900,000.00.



Winthrop Seawall



Today, approximately 4500 people live in the immediate vicinity of Winthrop Beach, about 25% of the total population of the town in a neighborhood of modest, affordable homes convenient to downtown Boston. The Beach roadways, often flooded during frequent coastal storms, provide the only vehicular access to the Deer Island Sewage Treatment Plant, which serves 2,500,000 people in the Metropolitan Boston area.

Without adequate shore protection, any investment in Beaches Program styled amenities

would be foolish. Winthrop demanded a different strategy.. In late 1998, we selected and contracted with a team of engineers and designers headed by Parsons/Brinkerhoff as lead consultant, and including Applied Coastal as the marine engineering subcontractor, began a comprehensive reevaluation of the problems and issues producing:

A Marine Baseline Report assessed the condition of the beach, the wave, water and wind environment, shoreline change, sediment characteristics impacts of existing coastal structures and potential sand sources. Perhaps the most disturbing finding of this report was that since the 1950s the northern end of the beach system has lowered approximately 4 to 8 feet). Lowering of the beach, due to the lack of a natural sediment source had already resulted in failure of portions of the groins and would eventually result in loss of toe protection, expose the seawall foundation and result in failure of the wall.

A Conceptual Shore Protection Design Report reassessed all shore protection alternatives including breakwaters, groins, seawalls and revetments and beach nourishment and concluded that the structural alternatives alone would be ineffective in the absence of a natural sediment source. While they might reduce wave energy, they were useless against wave overtopping and associated flooding and with the continued erosion of the beach, would themselves be at risk of failure.

Beach nourishment however, could provide the first line of defense for the endangered seawall and work effectively with existing structures. the engineering team developed and modeled for performance, three alternatives nourishment designs, and recommended a nourishment with 500,000 yards at the northern and southern ends which would result in maximum benefit and longest performance.

To be effective, a nourishment must match the existing sand characteristics of the beach. A gradation analysis demonstrated that Winthrop Beach is characterized by a very coarse mix of sand and gravel. For best performance, a nourishment must match or exceed the relative coarseness of the existing beach.

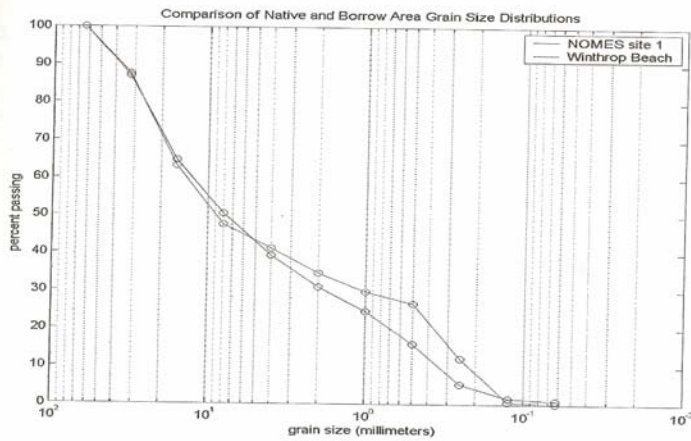


Figure 3-30 - Comparison of grain size distribution curves for native beach material and material from proposed borrow site
Source: Applied Coastal Research & Engineering, Inc.

Existing Winthrop and NOMES I compared.

Once nourishment was selected as the project goal, The team investigated upland, nearshore and offshore borrow sources. Upland sourcing presumed that sufficient commercial mix of the required specification and compatible with the beach in texture would be available and initial investigation assessed feasible means of transporting the material to the beach.. Upland sand source evaluation focused on requirements of transporting the required amount of material to beach as efficiently a possible and six methods were investigated and evaluated against multiple criteria including technical feasibility, impacts and costs. Eventually the team investigated five transportation alternatives.

Criteria for nearshore and offshore sites, the criteria required identifying sites with

- sufficient material, of compatible grain size,
- within reasonable distance to Winthrop,
- accessible by current dredging technology,
- minimal, potential environmental impacts
- and in locations that would not adversely affect other beach systems.

Fourteen nearshore and offshore sites were investigated and the NOMES I site, eight miles off Winthrop, with a near perfect match for the coarse sand and gravel mix that

characterizes Winthrop. At a depth of an average eighty feet, NOMES I was also suitable for a hopper dredge which would greatly simplify the dredging process. Additionally, vibracore sampling of the site indicated that the material was consistent throughout the site to a depth of over ten feet. Since dredging for Winthrop would not exceed six feet, this meant that the site after dredging would resemble, exactly, the makeup pre-dredging which is important for environmental considerations and prospects for the site to revert to its prior natural state.

Investigation of upland alternatives showed that Winthrop's location and characteristics substantially complicated and hindered effective delivery of upland sand. Winthrop is a densely developed community at the heart of Metropolitan Boston, and yet its essentially an island with only two roadway connections to the mainland. The beach is on the eastern extreme of the town and has an open, ocean exposure with no convenient port facilities.



Since Winthrop is prone to damaging coastal storms, the timeliness of each alternative is critical. A successful alternative must be accomplished quickly and efficiently. An incomplete project is at risk to partial or complete loss in a storm. Time therefore is of the essence. Efficiency and in engineering and logistics is also essential since these factors impact time. Cost was the last factor to be considered but this affects feasibility but time remains the critical factor. The alternatives would be fully developed through an extensive public and environmental coordination process. From our perspective, as

upland alternatives proved too lengthy, complicated and costly, the NOMES I alternative was obviously preferable for its compatibility, accessibility, technical simplicity and appropriateness, cost and above all else, timeliness to completion.

The study process and project design occurred in the context of an extensive public and regulatory review process. Five general public meetings were held between 1999 and 2001. Additionally, the team met in series of five intensive and issue focused project review meetings with a Citizens Advisory Committee. Throughout the project design and analysis and commencing in July of 1999 the team also reviewed the project design development over three meetings with the MEPA appointed, Beaches Technical Advisory Committee and comprised of representatives of environmental regulatory and resource protection agencies. Additionally, on the advice of CZM staff, the team agreed to follow the so-called Highway Methodology for a pre-application review committee (PRC) for the (Federal) Army Corps of Engineers issued 401 permit. The intent of the methodology is to identify, negotiate and resolve potential environmental problems prior to permit application. The Committee was made up of most of the same representatives of state and federal resource agencies. The PRC met five times over sixteen months.

From the beginning we understood that some regulators were strongly opposed to the use of *any* offshore borrow for nourishment but we believed that the unique and compelling constraints of the Winthrop project required have a fair and thorough analysis of the benefits and impacts of the use of the NOMES I site along with the investigation of the upland alternatives.

To understand the implications of a mining dredge at the NOMES I site and its potential impacts, it was essential to understand its value to fisheries and characterize its biology. Some agencies reps contended that although the site was valuable habitat for marine fisheries, it was not possible to effectively assess its functions and values a thorough analysis should take over ten years. Our own investigations however indicated that the biology could be effectively characterized and that reasonable predictions could be made about impacts, their duration and more importantly the site's potential for recovery. The Army Corps' biologist believed that no analysis was necessary since all indications were that the site would rapidly recover from the effects of dredging.

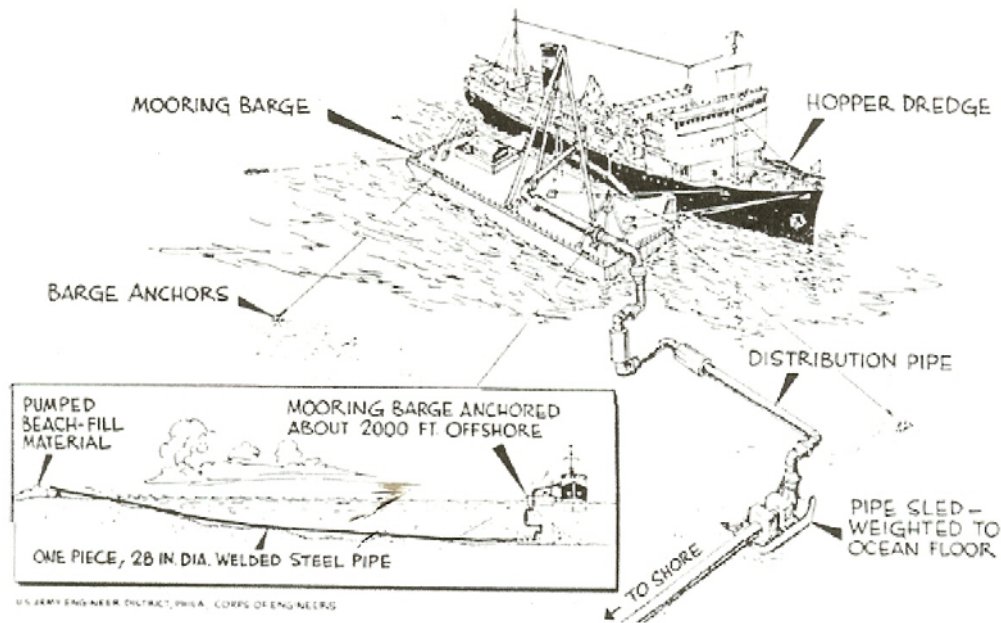
Detailed analysis of upland alternatives uncovered serious shortcomings. The delivery processes would be necessarily cumbersome and complex requiring multiple transfers of material and providing numerous opportunities for problems and delays. Time for completion would vary by alternative between eighteen and forty-two months and subject a partially completed project to multiple storm seasons. Trucking was quickly disqualified because it required the longest time and would require over thirty-three thousand truck trips.



Main St, one of two access roads

In contrast offshore dredging was the simplest option since the hopper dredge would also transport the material to an offshore pump off and the work could be completed with two months.

100011.



Typical Hopper Dredge operation

While, the PRC committee eventually reached consensus that beach nourishment was the LEDPA (*least environmentally damaging practicable alternative*) for Winthrop Beach no similar agreement could be reached over a borrow source since as we believed, the upland alternatives were impractical for the conditions at Winthrop. . The PRC was also not able to reach agreement on the scope, extent or duration of a marine biological study for the NOMES I site.

Recognizing that a likely consensus was beyond reach, the team decided to exit this phase of the pre-application process after nearly 18 months and elected to file the Draft Environmental Impact Report (DEIR) with MEPA in December of 2002. The heart of the report was an alternatives analysis that investigated and evaluated the five upland alternatives as well as the offshore NOMES alternative. The report also included an Essential Fish Habitat Analysis for NOMES and an assessment of likely impacts using the limited Division of Marine Fisheries Data available for the site.

The MEPA 1/30/03 Certificate for the DEIR, laid out the scope for the Final EIR, and required an expanded alternatives analysis that would include further detailed development of two of the upland source alternatives (ocean going barge and use of the hopper barge to transport upland sand) as well a twelve month marine biological study of

the NOMES site.

Once again, the team met with the Beaches TAC and the PRC as well as several public meetings. And again, defining the scope of the biological study would prove a major stumbling block. The team developed a comprehensive scope in keeping with industry standards but as work was about to proceed National Marine Fisheries Service required a 180 day endangered species consultation which due to the structured nature of the study delayed start of the twelve months of trawling phase for over a year..

The study scope, included expanded bathymetric survey by side scan sonar, video recording benthic sampling in the spring and fall, 29 trawls over 12 months, including analysis and stomach analysis and ichthyoplankton sampling at the proposed borrow site and a reference site as a scientific control.



Figure 3-40 – Photograph of bottom sediments in NOMES Site I where the area of the photograph is 76 cm x 51 cm (approximately 30 inches x 20 inches). Therefore, all material shown in the photograph is less than 2 inches in diameter.

Source: Gutierrez, et al., 2001

Typical bottom at NOMES I

Based upon literature study primarily of comparable dredging on similar bottom types, the team determined that recovering could reasonably be expected with two to three years

but proposed a monitoring program for up to twelve years. The team also proposed dredging design modifications that would minimize impacts and include features that could aid or accelerate recovery.

While the marine study for NOMES was progressing, the team was also further developing the engineering analysis of the two upland alternatives, delivery by ocean going barge or by a hopper dredge. The two alternatives are identical on the landside sourcing, delivery, storage and transfer, they are distinguished by the final method of delivery to the beach itself. The intent of the hopper dredge alternative was to simplify the delivery at the beach.

While the team theoretically reduced the time for placement for both options to a potential five months, the limitations in the logistics of the supply chain and the lack of suitable convenient locations for the storage and transfer of the material would require a twelve month mobilization prior to placement and is the principal limiting factor. The team investigated likely port facilities between Searsport Maine and Connecticut. Further the necessarily complex logistic of multiple handling, transfer and storage results in numerous opportunities for problems and delays.

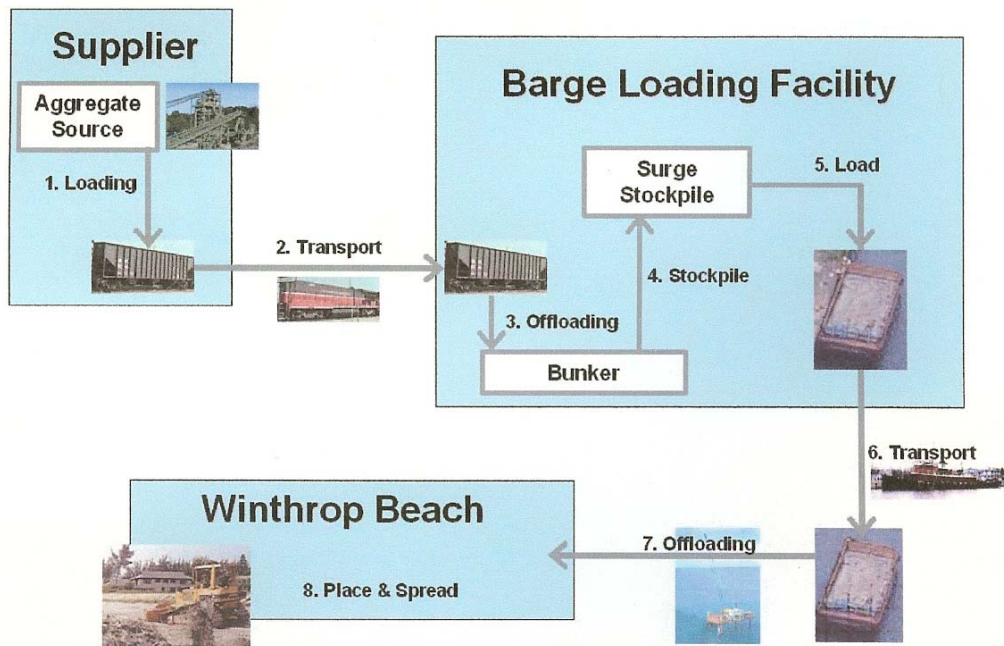


Figure 4 – Upland Supply Chain: Steps in procuring beach nourishment material at a commercial aggregate supplier and delivering it to Winthrop Beach.
Graphic by PB.

Complicated, multiple handling of upland

Since it's highly unlikely that a sufficiently coarse material that meets the specification will be naturally occurring, it will need to be manufactured and likely would come from multiple sources. The material must then be transported by rail or truck to a port facility with sufficient room to stockpile material and appropriate facilities to transfer the material to a barge or the hopper dredge. The team was able to identify only two possible port facilities with adequate capacity within the region to support these alternatives. However hopper dredges are not designed to be top loaded and industry representatives expressed reluctance to use their specialized boats in this, potentially hazardous way. If feasible, it would also be the most expensive of the three alternatives.

Delivery to the beach by ocean going barge requires a transfer point and since Winthrop Beach lacks any deep water marine facilities, a temporary barge would be required to offload the fill from the barges. In the event of a substantial storm the platform would necessarily be demobilized adding to complexity, delay and cost.

The use of the NOMES I site for Winthrop would have short term, but recoverable, environmental consequences. Experience of other projects indicates that these effects are

reversible and that recovery is possible within two to three years; this project has proposed monitoring of recovery for up to twelve years as necessary. A properly designed dredge also has the possibility of improving the habitat value of the site and hastening recovery through deliberate dredging techniques and creating a post dredge environment favorable to threatened marine species. No impact is the most desirable outcome, but the scope, urgency and public safety benefits of the project must be weighed against reversible effects of a one- time action. The impact must also be put in proper context. The borrow site is fifty acres of at habitat type but that comprises at least sixty-five percent of Massachusetts Bay and represents hundreds of thousands of acres.

A final Environmental Impact Report was submitted to MEPA in December 2005 and the Secretary's Certificate, issued in February found that we had adequately assessed all alternatives and recommended that mitigation be developed through the permitting process.

While the project has been in design, analysis, consultation and permitting for the past seven years, conditions at the Beach have continued to deteriorate at an increasing pace. Normal tidal action, not a significant storm has undercut a portion of the wall by Pearl Avenue threatening the wall itself and the road and neighborhood beyond.



Failing wall at Pearl Avenue

DCR responded with a \$500,000 emergency temporary repair.



Temporary Repairs

The goal of the larger project remains to create a safe environment and to eliminate the need for costly emergency responses such as this and to create a long lasting, responsible, secure and cost effective solution.